National Institute of Environmental Health Sciences

Modeling the impact of climate change in Germany with biosphere models for long-term safety assessment of nuclear waste repositories

Author(s): Staudt C, Semiochkina N, Kaiser JC, Prohl G
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Abstract:

Biosphere models are used to evaluate the exposure of populations to radionuclides from a deep geological repository. Since the time frame for assessments of long-time disposal safety is 1 million years, potential future climate changes need to be accounted for. Potential future climate conditions were defined for northern Germany according to model results from the BIOCLIM project. Nine present day reference climate regions were defined to cover those future climate conditions. A biosphere model was developed according to the BIOMASS methodology of the IAEA and model parameters were adjusted to the conditions at the reference climate regions. The model includes exposure pathways common to those reference climate regions in a stylized biosphere and relevant to the exposure of a hypothetical self-sustaining population at the site of potential radionuclide contamination from a deep geological repository. The end points of the model are Biosphere Dose Conversion factors (BDCF) for a range of radionuclides and scenarios normalized for a constant radionuclide concentration in near-surface groundwater. Model results suggest an increased exposure of in dry climate regions with a high impact of drinking water consumption rates and the amount of irrigation water used for agriculture.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Extreme Weather Event, Food/Water Quality

Extreme Weather Event: Drought

Food/Water Quality: Other Water Quality Issue

Water Quality (other): radionuclides

Geographic Feature:

resource focuses on specific type of geography

Freshwater

Geographic Location:

resource focuses on specific location

Non-United States

Non-United States: Europe

European Region/Country: European Country

Other European Country : Germany

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Mitigation/Adaptation: ☑

mitigation or adaptation strategy is a focus of resource

Mitigation

Model/Methodology: ☑

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Resource Type: ☑

format or standard characteristic of resource

Research Article

Timescale: ☑

time period studied

Long-Term (>50 years)

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content